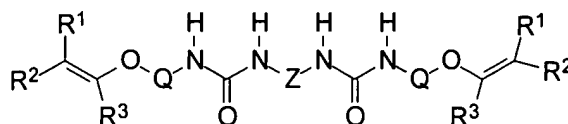


6. [A] The vinyl ether compound according to claim 9 having the structure:



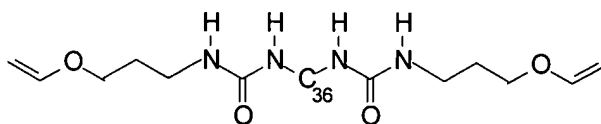
in which

R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> are independently hydrogen, a methyl group, or an ethyl group;

Q is an alkyl or alkylenoxy linear or branched chain having 1 to 12 carbon atoms;

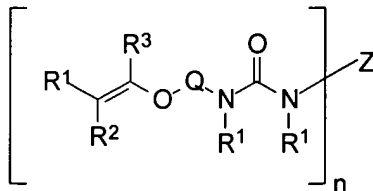
Z is a branched or linear alkane, which may contain cyclic moieties, a siloxane, a polysiloxane, a C<sub>1</sub> to C<sub>4</sub> alkoxy-terminated siloxane or polysiloxane, a polyether, a polyester, a polyurethane, a poly(butadiene), or an aromatic, polyaromatic, or heteroaromatic group.

7. The vinyl ether compound according to claim [5] 9 having the structure



in which C<sub>36</sub> is a mixture of isomers of a 36 carbon linear or branched chain.

9. A vinyl ether compound having the structure:



in which

n is 1 to 6;

R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> are hydrogen, methyl or ethyl;

Q is an alkyl or cycloalkyl linear or branched chain having 1 to 12 carbon atoms; an alkylenoxy chain having 1 to 12 carbon atoms, or aromatic or fused aromatic ring having 3 to 10 carbon atoms and optionally containing the heteroatoms O, N or S;

Z is a branched or linear alkane, which may contain cyclic moieties, a siloxane, a polysiloxane, a C<sub>1</sub> to C<sub>4</sub> alkoxy-terminated siloxane or polysiloxane, a polyether, a polyester, a polyurethane, a poly(butadiene), or an aromatic, polyaromatic, or heteroaromatic group.

DIE ATTACH ADHESIVES WITH VINYL ETHER AND  
~~CARBAMATE OR~~ UREA FUNCTIONALITY

insert <sup>5</sup> ~~CARBAMATE OR UREA FUNCTIONALITY~~ This application is a divisional of application serial number 09/573,303.

## FIELD OF THE INVENTION

~~This invention relates to die attach adhesives containing resins that~~  
~~contain both vinyl ether and either carbamate, thiocarbamate or urea~~  
~~functionality, and to adhesives containing those compounds.~~

## BACKGROUND OF THE INVENTION

Adhesive compositions, particularly conductive adhesives, are used for a variety of purposes in the fabrication and assembly of semiconductor packages and microelectronic devices. The more prominent uses are the bonding of integrated circuit chips to lead frames or other substrates, and the bonding of circuit packages or assemblies to printed wire boards.

There exist electron acceptor/donor adhesives that contain vinyl ethers as the donor compounds for use in low modulus adhesives, particularly in fast-cure adhesives for die attach applications. However, die attach adhesives containing commercially available vinyl ethers frequently suffer from poor adhesion, resin bleed and voiding due to the volatility and non-polar nature of these commercial vinyl ethers. Thus, there is a need for improved die attach adhesives utilizing vinyl ethers containing polar functionality in order to address these performance issues.

## SUMMARY OF THE INVENTION

25            This invention relates to die attach adhesive compositions containing resins that have vinyl ether and polar functionality, such as a carbamate, thiocarbamate or urea functionality, on a molecular (small molecule) or

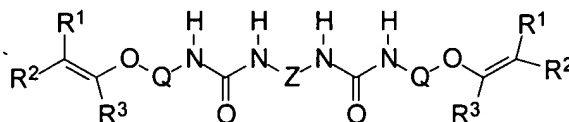
ABSTRACT OF THE INVENTION

Compounds with both vinyl ether and ~~carbamate, thiocarbamate or~~  
urea functionality are suitable for use in microelectronics applications, and  
5 ~~show enhanced adhesive strength compared to compounds that do not~~  
~~contain carbamate, thiocarbamate or urea functionality.~~

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CLAIMS  
MARKED-UP VERSION SHOWING CHANGES MADE

6. ~~The~~ <sup>the</sup> vinyl ether compound having the structure:  
1



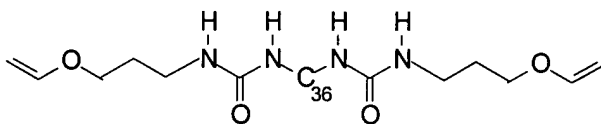
in which

$R^1$ ,  $R^2$ , and  $R^3$  are independently hydrogen, a methyl group, or an ethyl group;

Q is an alkyl or alkylenoxy linear or branched chain having 1 to 12 carbon atoms;

Z is a branched or linear alkane, which may contain cyclic moieties, a siloxane, a polysiloxane, a  $C_1$  to  $C_4$  alkoxy-terminated siloxane or polysiloxane, a polyether, a polyester, a polyurethane, a poly(butadiene), or an aromatic, polyaromatic, or heteroaromatic group.

7. The vinyl ether compound according to claim <sup>9</sup> ~~8~~ having the structure



in which  $C_{36}$  is a mixture of isomers of a 36 carbon linear or branched chain.

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